



KDI Precision Products, Inc.
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IMPROVED ARTILLERY PROXIMITY FUZE

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Munitions Technology Symposium VII*



NDIA

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Presentation Outline



- **Need for Improved Artillery Proximity Fuze**
- **Design Goals**
- **Design Approach**
 - ✧ **RF front end**
 - ✧ **Signal processor**
 - ✧ **Battery**
 - ✧ **S&A**
- **Future design enhancements**



Need for Improved Artillery Proximity Fuze



- **MK417/418 has history of problems**
 - ✧ **Early bursts**
 - ✧ **Duds**
 - ✧ **Poor HOB control**
 - ✧ **Not production-friendly**
 - ✧ **Obsolete parts**
- **No low-cost alternatives capable of both air and ground targets**



Design Goals



- Capable of air and ground targets
- Operation independent of round (not body-excited)
- NATO shape factor
- Surface mount technology
- Low cost
- Impact back-up mode



Design Approach

- RF front end
- DDR signal processor
- MK41 S&A
- German Battery



RF Front End



- **Optimized for air targets**
 - ✧ **Low noise discrete oscillator**
 - ✧ **Monopole antenna for good side coverage**
- **Will work well with ground targets**
 - ✧ **Low-angle approaches benefit from side coverage**
 - ✧ **enhanced sensitivity overcomes front-end null in high-angle approaches**



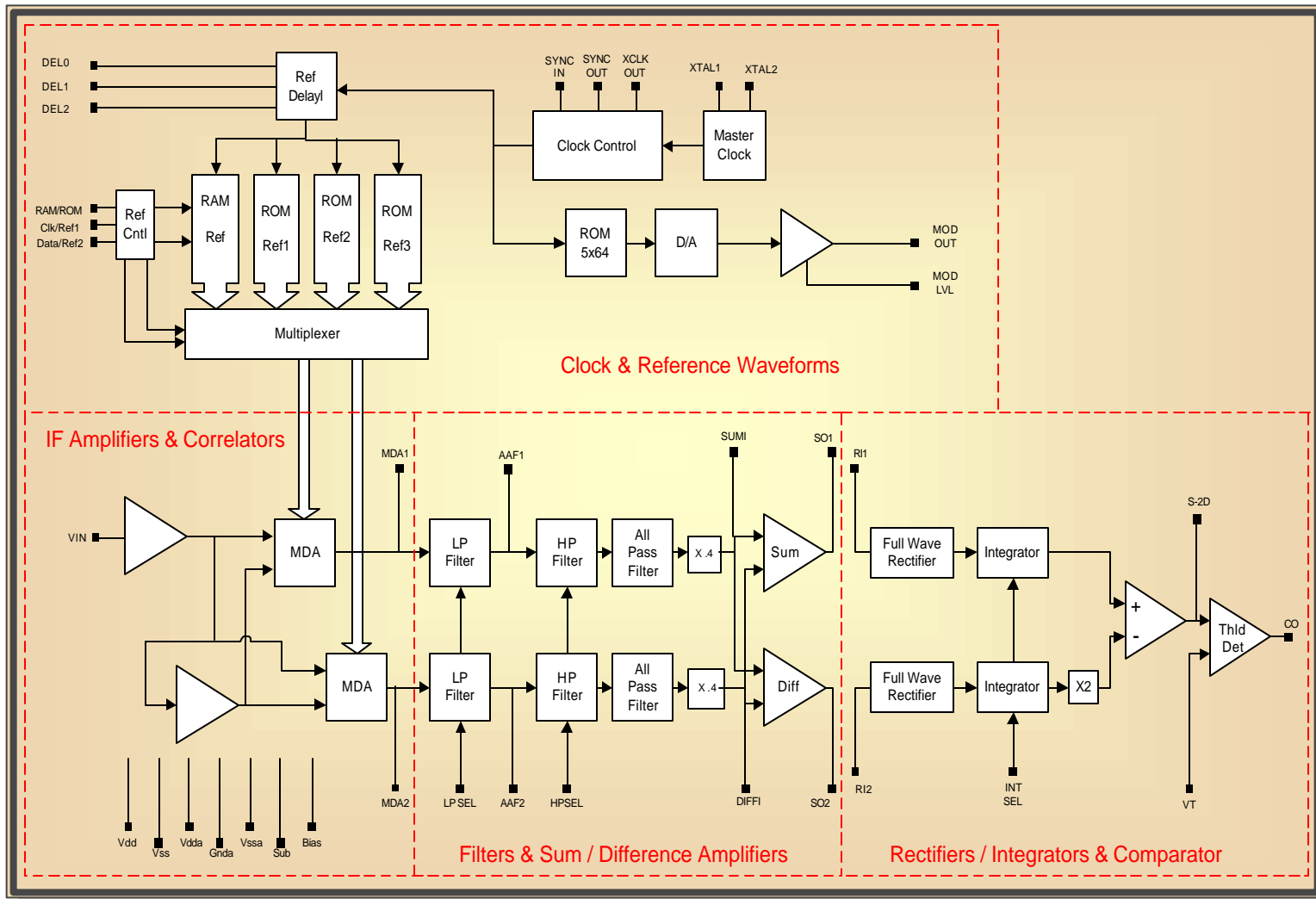
DDR Overview



- **Based on FM-CW architecture**
- **Correlation waveforms stored in memory**
- **Accurate HOB independent of target reflectivity**
- **Highly resistant to ECM**
- **Completely integrated for reliability, low cost**
- **DDR currently fielded in the highly successful M734A1 Multi-option Fuze for Mortars**



Block Diagram of KDI ASIC

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Summary of Key ASIC Features



- **Programmable reference waveforms**
 - ✧ Allows tailoring of target-specific range responses
 - ✧ Downloaded from μ P (can be changed during flight)
- **Low noise for use in air target applications**
- **Low Power**
- **Selectable wide band filters**
 - ✧ Can process wide range of Doppler frequencies
- **Multiple ASICS can be synchronized**
 - ✧ Allows implementation of more complex fuzing algorithms



S&A

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- **MK41 is a qualified design**
- **Low cost**
- **Performance parameters:**
 - ✧ **Setback g level: 26,000 g**
 - ✧ **Spin rate: 410 rps**
 - ✧ **Velocity: 3075 ft/sec**



Battery



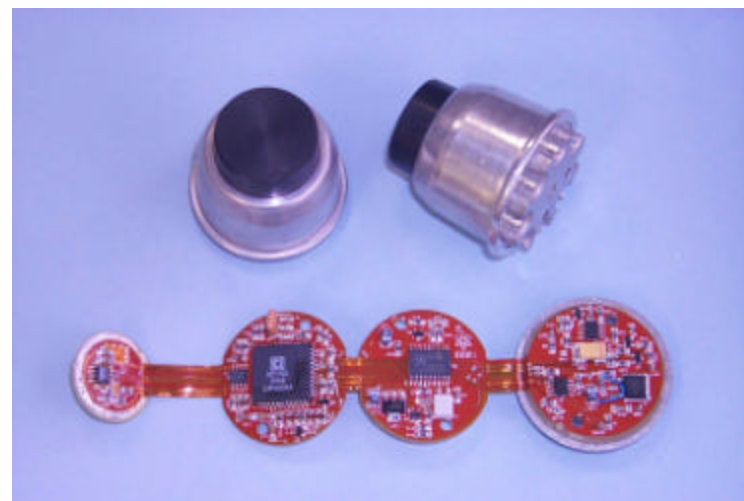
- **German made (Friedmann & Wolf)**
- **Chemistry: Pb/HBF₄/PbO₂**
- **Proven design for artillery**
- **Performance parameters:**
 - ✧ **Operational life:** 150 seconds
 - ✧ **Current:** 150 mA max
 - ✧ **End of life voltage:** 5.5 Volts min
 - ✧ **Rise time:** 100 mSec max
 - ✧ **Required setback:** 1200 g's min
 - ✧ **Required spin:** 2500 rpm min
 - ✧ **Operating temperature:** -45F to +145F



Photos of Old Vs. New Design

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New Design:



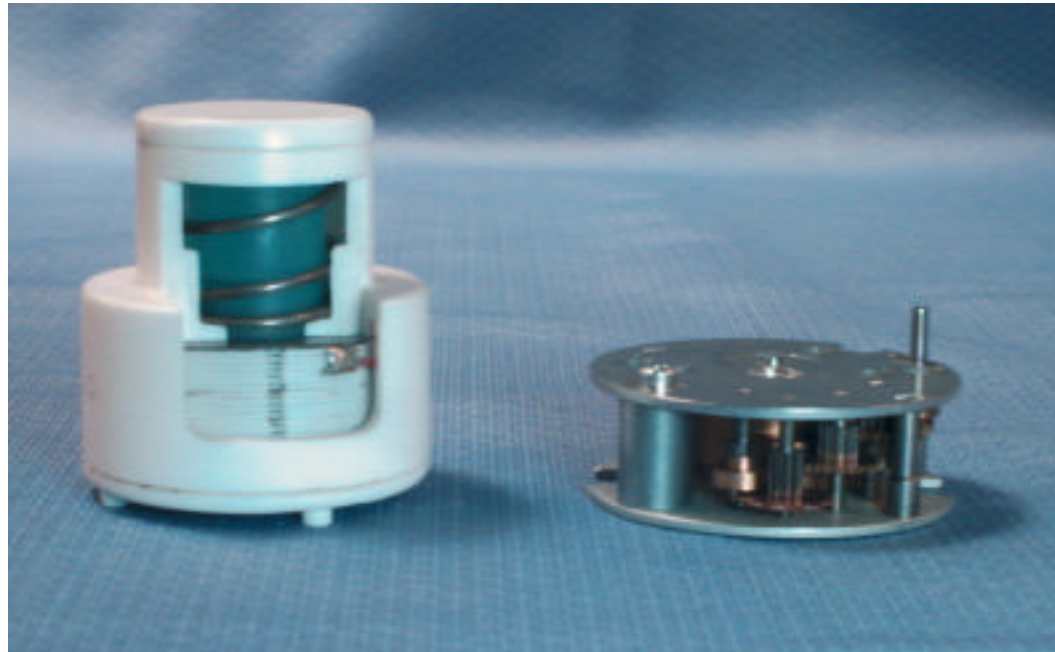
Old Design:





Photo of Battery and S&A

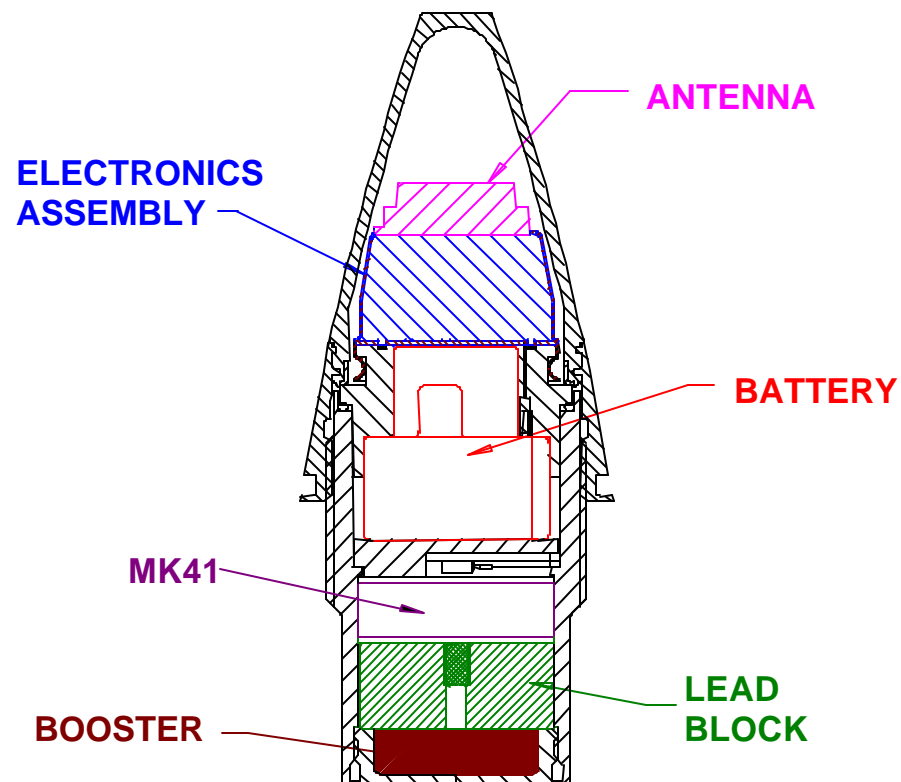
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Computer Plot of Cutaway

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Future Design Enhancements



- **ASIC flexibility provides adaptability to a wide variety of systems**
- **Possible enhancements include inductive-set programmable time capabilities**